

A SOUND-ACTIVATED METHOD FOR RECORDING INSECT ACTIVITY¹

JAMES L. FRAZIER AND FRANK W. FISK²

Department of Zoology and Entomology, The Ohio State University, Columbus

Although automatic devices for recording the activity of animals have been in use since the first revolving drum was described by Stewart (1898), improvements, modifications and novel approaches to the problem are still being reported. The principle types of aktographs that have been used with insects, in addition to the activity wheel (Roberts, 1960), are the "jiggle cage" (Bursell, 1959), the rocking cage (Nowosielski and Patton, 1963) and the capacitance-sensing device (Schechter, et al. 1963). Except for the last named, these devices all involve an obvious motion of a cage or chamber by the test insect(s) which differs from the situation in the natural habitat or usual rearing containers for these insects. Lacy (1944) demonstrated that test animals behave aberrantly when transferred from rearing cages

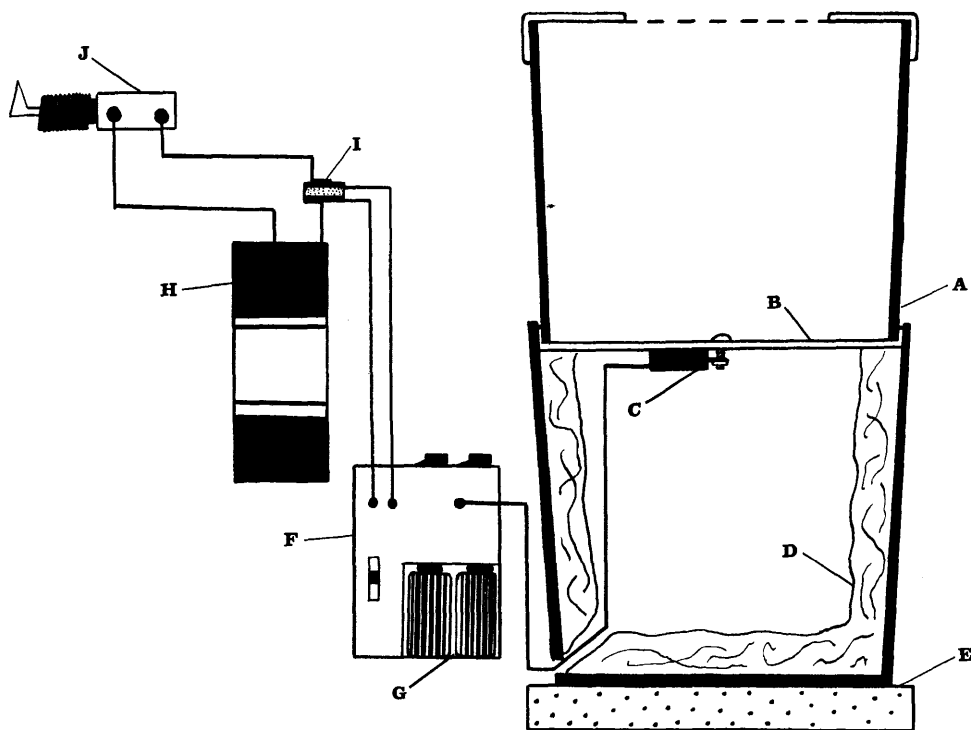


FIGURE 1. Schematic diagram of the sound-activated aktograph. A. upper plastic canister, B. aluminum plate, C. contact microphone, D. fiberglass insulation, E. foam rubber pad, F. sound-activated switch (with sensitivity and delay controls), G. 9 v transistor batteries, H. 1½ v dry cell battery, I. insulated wafer, J. signal magnet recording pen (recording drum and record not shown).

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²Graduate Research Assistant and Associate Professor, respectively.

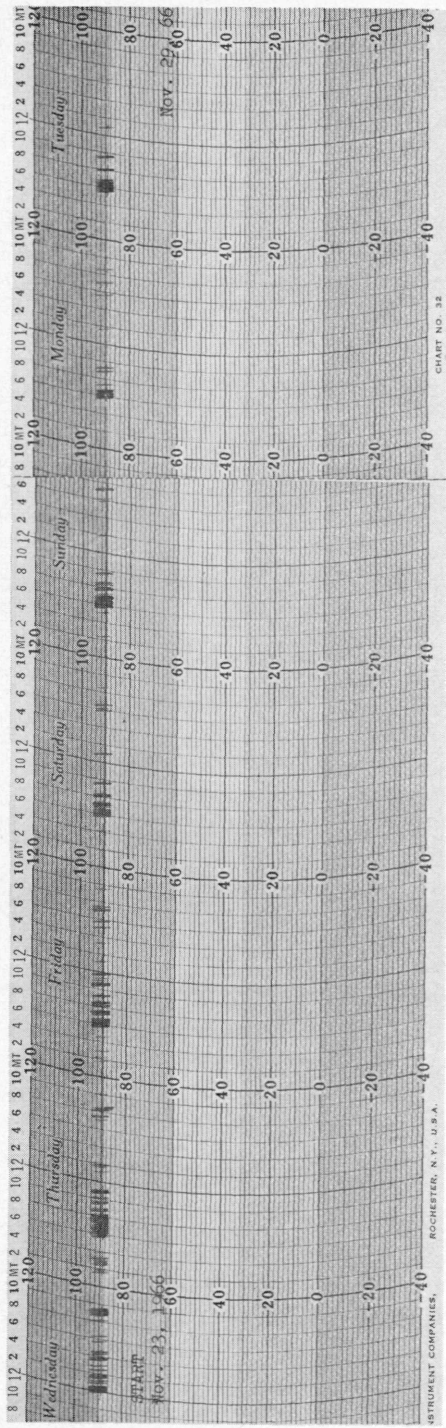


FIGURE 2. One week's record of activity from a single female *Byrsotria fumigata* cockroach on a 12-hour day (lights on from 6 A.M. to 6 P.M.). Food and water were present at all times. A diurnal periodicity is evident in this example.

to aktographs, even after extended periods of accommodation to the test containers.

The aktograph reported here shares with capacitance-sensing devices the lack of obvious motion of test chamber, and in addition it provides an environment almost identical to the usual rearing containers of our test insects. In fact the test insects could be reared in the aktograph from birth, if need be. In comparison with a recently described capacitance-sensing aktograph (Chambers and Salmons, 1966), our equipment is relatively simple and inexpensive.

The aktograph (figure 1) consists of two 20 cm diam. clear plastic canisters³ fitted one inside the other. The bottom of the top canister has been removed and replaced with a close-fitting aluminum pie tin to which a contact (harmonica) microphone is securely fastened on the underside, center. The bottom canister is lined with fiberglass insulation and rests on a foam rubber pad to dampen external vibrations. The top canister forms the aktograph chamber and is supplied with a small water container, dog biscuit, a few dry wood chips and a screen cover. One or more cockroaches (or other insects) are placed in the aktograph for at least 24 hours before records are taken.

The microphone leads pass through a hole in the lower canister to a commercially available sound-activated switch, powered by two 9 v transistor batteries which should be replaced at weekly intervals. Substrate vibrations detected by the contact microphone activate the switch to close a 1½ v circuit operating a signal magnet recording pen. The pen traces a record on the drum of a line-operated recording thermometer, thus giving a weekly record of the occupants' activity (figure 2). By manually changing the position of the pen on the drum once a week, it is possible to have several weeks' records on the same sheet. The temperature recording pen of the thermometer may be disengaged or permitted to operate simultaneously.

This set-up has been used to record gross activity of cockroaches varying in weight from a single 70 mg brown-banded cockroach, *Supella supellectilium* (Serv.), to groups of the Cuban burrowing cockroach, *Byrsotria fumigata* (Guerin), each weighing over 4000 mg. As can be seen in figure 2, a diel periodicity is evident and a circadian rhythm may be indicated. It should be pointed out that the use of a contact microphone is essential in detecting substrate vibrations caused by the insects' walking or running, while at the same time screening out audible signals from outside the apparatus. It is possible, though not recommended, to carry on normal conversation very close to the aktograph without activating the sound switch.

Suggested modifications include the use of a simple 24-hour time switch to drive the recording drum, as described by de Roth (1965). This would replace the recording thermometer and reduce the cost of the apparatus to as little as \$65.00. The aktograph's usefulness could also be extended by including a transistorized tape recorder in the circuit, in order to record the actual sounds which activate the switch. Such a record would readily identify any interfering sounds or vibrations from outside sources.

³Specifications and sources of supply for particular items described here are available from the authors.

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